



ENERGY STAR® Program Requirements for Residential Ventilating Fans

DRAFT 1 – Eligibility Criteria (Version 2.0)

Below is the **DRAFT 1** product specification (Version 2.0) for ENERGY STAR qualified residential ventilating fans. A product must meet all of the identified criteria to earn the ENERGY STAR.

- 1) **Definitions:** Below is a brief description of a residential ventilating fan and other terms as relevant to ENERGY STAR.
 - A. **Residential Ventilating Fan:** A ceiling or wall-mounted fan designed to be used in a bathroom or utility room, or a kitchen range hood, whose purpose is to move objectionable air from inside the building to the outdoors. Residential ventilating fans used for cooling (e.g., whole-house fans) or air circulation are excluded. Residential ventilating in-line fans (including radon eliminating fans), multi-port fans, heat/energy recovery ventilation fans ducted to the ventilated space, and powered attic ventilators (e.g., gable fans) are excluded but may be considered in a future version of this specification. Residential ventilating fans with electric resistance heating elements, fans with heat lamps, and fans with lamp sockets that accept incandescent lamps for general lighting are excluded from this specification. This specification does not address passive ventilation of any kind.

Note: Residential ventilating fans with electric resistance heating elements or heat lamps, previously included under Version 1.0, are now excluded under Version 2.0. The intent of this change is to encourage manufacturers to use or develop heating technologies that have fewer environmental impacts than electric resistance heating elements or heat lamps. Equally important is the intent by EPA to minimize customer misperceptions that the heat source in these units is also ENERGY STAR qualified. Two existing ENERGY STAR qualified models will be affected by this change.
 - B. **Combination Unit:** A residential ventilating fan that contains a light source for general lighting and/or a night light.
 - C. **HVI 915, “HVI (Home Ventilating Institute) Procedure for Loudness Rating of Residential Fan Products”:** Procedure used for testing and rating ventilation fan products for sound. This test procedure includes laboratory requirements and methods for obtaining sound pressure, sound power, and sone values.
 - D. **HVI 916, “HVI Airflow Test Standards”:** Airflow test standard that establishes uniform methods for laboratory testing of powered residential ventilating equipment for airflow rate. This publication covers the test equipment, tests of specific HVI classification groups, test reports, and policies for maintaining the standard.
 - E. **HVI 920, “HVI Product Performance Certification Procedure Including Verification and Challenge”:** Publication that defines and specifies certain aspects of the procedures, covering such points as the actual testing, the certification process, challenge procedures, and the use of HVI trademark and labels.
 - F. **Inch of Water Gauge (w.g.):** A traditional unit of pressure used to describe both water and gas pressures. The conventional equivalent of one inch of water is 249.0889 pascals, which is 2.490889 millibars, about 0.036127 pounds per square inch (psi) or about 0.073556 inches (1.86832 millimeters) of mercury. The word "gauge" after a pressure reading indicates that the pressure stated is actually the difference between the absolute, or total, pressure and the ambient

air pressure at the time of the reading.

- G. Light Source: The lighting portion of a combination unit or a range hood. For units using a compact fluorescent or fluorescent lamp, the light source includes the lamp and the ballast.
 - H. Power Consumption: The operation of the fan motor consumes electrical power measured in Watts (W). Under this specification, power used for lights, sensors, heaters, timers, or night lights is not included in the determination of power consumption.
 - I. Sone: An internationally recognized unit of loudness, which simplifies reporting of sound output by translating laboratory logarithmic decibel readings into a linear scale that corresponds to the way people sense loudness. A sone is equal in loudness to a pure tone of 1,000 cycles per second at 40 decibels above the listener's threshold of hearing.
- 2) Qualifying Products: In order to qualify as ENERGY STAR, a residential ventilating fan must meet the definition in Section 1A and the specification requirements provided in Section 3, below. For the purposes of this specification, residential ventilating fans include the following product types: range hoods, and bathroom and utility room; including ducted and direct-discharge models. Residential ventilating fans with lights, including those with night lights, must meet the requirements outlined in Table 2, provided in Section 3, below. Ventilating fans with sensors and timers may qualify under this specification. Residential ventilating fans qualifying under this specification can also be used in small commercial applications (i.e., bathroom of a restaurant).

Note: EPA believes that the product categories covered under this Draft 1 (Version 2.0) specification reflect those categories typically marketed to the consumer. However, EPA is open to comments on these product designations as well as any that may have been inadvertently excluded and should be captured within this section.

- 3) ENERGY STAR Specification Requirements for Qualifying Products: Only those products described in Section 2 that meet the energy-efficiency criteria outlined in Table 1, below, may qualify for the ENERGY STAR. In addition to these requirements, all qualifying residential ventilating fans must also meet those requirements listed in Sections A-C, as appropriate.

Table 1 Draft 1 Criteria for ENERGY STAR Qualified Residential Ventilating Fans – Minimum Efficacy Levels	
Airflow (cfm)	Minimum Efficacy Level (cfm/W)*
Range Hoods (up to 500 cfm)	2.8
Bathroom and Utility Room Fans (1 to 75 cfm)	1.4
Bathroom and Utility Room Fans (76 cfm and over)	2.8

*Based on measured airflow at 0.1 in. w.g. static pressure

Note: Clarification regarding test conditions was added to Table 1 (see Sections 3.B.3 and 4.D). The minimum efficacy levels, shown in Table 1 above, are the same requirements included in the current Version 1.0 specification. Sound level requirements, previously included in this table, have been moved to Section 3.B.2, below.

A. Lighting Requirements:

1. Starting January 1, 2003, the following products may qualify as ENERGY STAR:
 - a. Residential ventilating fans with no light source
 - b. Combination unit residential ventilating fans having a light source that is an ENERGY STAR qualified light fixture or meeting performance criteria listed in Table 2, below.
Light sources that have lamp sockets that accept incandescent lamps are excluded.

Table 2 – Light Source Criteria	
Performance Characteristic	ENERGY STAR Specification
System Efficacy per lamp ballast combination (see notes at end of table)	<p>≥ 46 lumens per Watt for all light sources that are < 30 listed lamp Watts.</p> <p>≥ 60 lumens per Watt for all light sources that are ≤ 24 inches and ≥ 30 listed lamp Watts.</p> <p>≥ 70 lumens per Watt for all light sources that are ≥ 24 inches and > 30 listed lamp Watts.</p>
Lamp Start Time	<p>The time needed after switching on the lamp to start continuously and remain lighted must be an average of one second or less.</p> <p>For manufacturers using magnetic ballasts and lamps with integrated electronic starting chips, lamps <u>must</u> be included with the residential ventilating fan when shipped from the factory.</p>
Lamp Life	<p>For residential ventilating fans that are shipped with a lamp, the average rated life of the lamp must be ≥ 10,000 hours.</p> <p>For residential ventilating fans that are not shipped with lamps, a list of lamp types must be provided that would result in the lighting source complying with the specification. This list must be clearly visible to the consumer on the residential ventilating fan packaging. Manufacturers are not required to provide specific lamp manufacturer names and model numbers on the packaging. Rather, generic lamp listings, such as the NEMA or ANSI generic descriptions will suffice.</p>
Color Rendering Index	<p>≥ 80 for compact fluorescent lamps.</p> <p>≥ 70 for linear lamps.</p>

Correlated Color Temperature	<p>For residential ventilating fans that are shipped with a lamp and do not have a <i>rated</i> color temperature of 2,700 Kelvin (K) or 3,000 K (actual measured CCT of 2,700 to 3,000K \pm 200K), the packaging should clearly describe the color of the product (cool or warm) and state its intended use.</p> <p>For residential ventilating fans that are not shipped with a lamp, a list of lamp types must be provided that would result in the light source complying with the specification. This list must be clearly visible to the consumer on the residential ventilating fan packaging. Manufacturers are not required to provide specific lamp manufacturer names and model numbers on the packaging. Rather generic lamp listings, such as the NEMA or ANSI generic descriptions will suffice.</p>
Noise	Class A sound rating for electromagnetic ballasts. Not to exceed a measured level of 24 dBA when measured in a room with ambient noise no greater than 20dBA.
Maximum Total Lamp Wattage (excluding night lights)	\leq 50 Watts. Lamp sockets cannot accept incandescent lamps.
Maximum Night Light Wattage	\leq 4 Watts.

Notes:

- Light Source efficacy shall be determined by the following equation:

$$\text{Light Source efficacy [Lumens per Watt]} = \frac{\text{Measured Lamp Lumens [Lumens]}}{\text{Measured Input Power [Watts]}}$$

- Lamp Lumens: Lamp lumens must be measured using the lamp and ballast that are shipped with the residential ventilating fan.
- Light Source Input Power: Light Source input power must be measured using the lamp and ballast that are shipped with the residential ventilating fan.
- For residential ventilating fans shipped without lamps, efficacy shall be determined by testing at least one of the lamp types listed on the fixture package.

Note: EPA's intent of excluding models that can accept incandescent lamps for general lighting under this Draft 1 Version 2.0 specification is to ensure the long term energy savings associated with using compact fluorescent and other energy-efficient light sources. This requirement also ensures that the consumer cannot replace the lamp with an incandescent bulb, thus guaranteeing these long-term savings. Information on lamps and ballasts may be supported by independent testing or from industry-accepted lists such as the NEMA/ALA Lamp and Ballast Platform Matrix.

These lighting requirements are consistent with ENERGY STAR's residential lighting fixture specification with the exception of the maximum total lamp wattage and the maximum night light wattage. The lamp and night light wattages are based on current sources being used and available technologies. For example, most units are currently using 7-Watt night lights while the 4-Watt night light lamps are readily available and fit the same sockets.

- B. Quality Assurance Requirements: To assure the quality of ENERGY STAR qualified residential ventilating fans, the following quality assurance requirements must be met for a fan to earn the ENERGY STAR:

Note: In developing ENERGY STAR specifications, EPA strives to set energy-efficiency performance levels that achieve energy savings without sacrificing performance and quality. EPA's approach to quality assurance in the original specification was to include a requirement for a product warranty that extends beyond the minimum one-year warranty typical for the industry. However, some manufacturers are concerned that extended warranties have not proven to increase actual product quality, nor the consumer's perception of quality in this industry. This has led EPA to examine more carefully the aspects of quality that affect customer perceptions of product quality. With this objective, EPA has identified the following three primary attributes that could affect perceived and actual product quality for residential ventilating fans: early product failure rate, fan sound levels, and installed fan performance. By specifying minimum requirements in these three specific areas, EPA believes that actual and perceived product quality will be assured for residential ventilating fans that earn the ENERGY STAR, without undue burden to participating manufacturers. **EPA is interested in obtaining industry feedback on this approach to assuring the quality of ENERGY STAR qualified fan models. In particular, EPA is interested in obtaining any research that would lead to setting effective and fair quality assurance requirements in the specific areas noted, as well as suggested revisions to the draft provisions outlined below. Those interested in discussing these issues further can contact Andrew Fanara, EPA, at fanara.andrew@epa.gov to schedule a meeting.**

1. Early Product Failure Rate

Partner shall provide at a minimum, a comprehensive one-year warranty for a product to qualify for the ENERGY STAR. Warranty coverage requirements **TBD**.

Note: The Tier I warranty requirement in the current (Version 1.0) specification is two years. A three-year warranty was scheduled to go into effect in July 2002 under Tier II; however, this effective date was delayed due to this specification revision process.

Initial or early product failure due to faulty workmanship is the first indicator of poor product quality. Such failures should be rare in ENERGY STAR qualified products and backed by a comprehensive warranty. EPA believes that a comprehensive, one-year minimum warranty is sufficient to protect consumers from these early failures. While some manufacturers and retailers have requested a longer warranty, EPA did not find sufficient evidence to justify the need for a longer warranty in an industry where one year is the minimum standard. As such, EPA has included a one-year minimum warranty, however, this warranty should be comprehensive, and should cover more than just the motor (a common practice in the industry). **EPA would like to pursue further discussions with industry regarding this approach and requests industry feedback on how to set the specific warranty requirements.**

2. Fan Sound Levels:

For most ventilating fan products, fan noise is the most obvious indicator of product quality to the consumer. Table 3, below, provides maximum noise levels allowed for residential ventilating fans to earn the ENERGY STAR.

Table 3 Draft 1 Criteria for ENERGY STAR Qualified Residential Ventilating Fans – Maximum Allowable Sound Levels	
Airflow (cfm)*	Maximum Allowable Sound Level (Sones)
Range Hoods (up to 500 cfm)	4.0
Bathroom and Utility Room Fans (1 to 75 cfm)	1.5
Bathroom and Utility Room Fans (76 cfm and over)	3.0

*Based on rated airflow, measured at 0.1 in. w.g. static pressure

Note: EPA has determined that product noise is the most prevalent indicator of quality in residential ventilating fans. All industry members have agreed that product noise is a part of quality. The following points illustrate that the industry recognizes sound as a very important (if not the most important) quality issue of a residential ventilating fan:

- HVI tests every fan model to establish noise level because consumers care about fan noise.
- A number of manufacturer focus groups have shown that the consumer correlates low sound to quality.
- Fan manufacturers' catalogs list their quietest fans in front and aggressively market quieter fans using a quality theme.
- Some manufacturers name their fans (especially their highest quality fans) based on the noise level.

Therefore, EPA is proposing to keep the sound requirement. Furthermore, the maximum allowable sound levels for bathroom and utility fans have changed under this Draft 1 Version 2.0 specification. The current (Version 1.0) specification requires lower sound levels for larger fans than for smaller fans, which is contradictory to industry practice. In addition, the sound level for smaller fans has been lowered to 1.5 sonas, compared to 2.0 sonas required in the Version 1.0 specification. This allows for a much quieter fan and many of the efficient fans found in the marketplace already meet this level. According to the ENERGY STAR qualified product listing, currently all qualifying models would continue to qualify as ENERGY STAR under this new requirement. For fans 76 cfm and over, the maximum allowable sound level was raised from 1.5 sonas to 3.0 sonas in order to enlarge the pool of eligible bathroom and utility fans within this airflow range.

3. Installed Fan Performance

All qualifying ventilating fan models, when measured by industry standard testing procedures at 0.25 in. w.g. static pressure, shall deliver a rated airflow (cfm) of at least 75% of the rated airflow delivered at 0.1 in. w.g. static pressure for that particular model.

Note: It is important that an ENERGY STAR qualified ventilating fan meet consumer's performance expectations. The inability of a fan to deliver close to its rated airflow when installed can raise quality concerns. This issue has arisen for ENERGY STAR qualified ventilating fans used in mechanical ventilation applications, where installed airflow measurements have been reported that are significantly below rated airflows. Installed airflow reductions occur when the static pressure drop of the installed duct system is greater than the static pressure used to measure rated airflow. While actual installed static pressure is beyond the control of the manufacturer, the amount of airflow reduction a fan experiences under elevated static pressures is controllable. Since this airflow reduction directly affects the efficacy (CFM/Watt) of a fan when installed, EPA would like to ensure that ENERGY STAR qualified fans do not suffer from significant reductions of this type. The relevance of this issue is even more significant with the increasing use of flex ducts in home construction today, leading to ventilating fans that typically operate at static pressures significantly higher than the 0.1 in. w.g. used by most manufacturers to rate their fans.

To address this performance issue, EPA first considered switching the reference static pressure for reporting fan performance (efficacy) from 0.1 to 0.25 in. w.g. However, EPA believes this approach may lead to confusion, since product literature and directories report the airflow measurement for most ventilating fans at 0.1 in. w.g. In addition, it would require a new measurement (i.e. fan power at 0.25 in. w.g.), placing an undue burden on manufacturers. Therefore, since EPA's primary interest lies in installed product performance, EPA is instead proposing that ENERGY STAR qualified ventilating fans be required to have a measured airflow at 0.25 in. w.g. static pressure that is no less than 75% of the minimum rated airflow for the fan at 0.1 in. w.g. static pressure. This proposed limit was based on discussions with HVI regarding typical residential ventilating fan curves. According to HVI, a typical fan will achieve 75% to 85% of rated flow at 0.1 in. w.g. when the static pressure is increased to 0.25 in. w.g. However, values as low as 20% have been measured in some fans. EPA believes this new approach will satisfy its need for quality assurance of installed efficacy, without creating confusion or undue burden to manufacturers, since HVI already performs airflow measurements for fans at both 0.1 and 0.25 in. w.g. **To facilitate this, EPA would like to collect airflow data (cfm) measured at 0.25 in. w.g. static pressure for individual models to determine if this requirement is reasonable. EPA would also like feedback from industry on this approach to assuring that ENERGY STAR qualified ventilating fans deliver acceptable performance.**

C. Inclusion of Installation Instructions: Picture diagram-type installation instructions shall be included with each qualified ventilating fan. The instructions shall indicate the following:

1. How to properly seal the fan with caulk or other similar material to inhibit air leakage to the exterior of the thermal envelope of the building.
2. Recommended ductwork types, elbows (including radii), terminations, sealants, and lengths that will minimize static pressure losses and promote adequate airflow.
3. Proper installation of vibration deadening materials such as short pieces of flexible duct.
4. Proper installation of insulation around the fan to minimize building heat loss and gain.

Note: EPA has heard from a number of stakeholders that inclusion of installation instructions with residential ventilating fans is commonplace, and that proper installation is critical to maintain efficiency and quality. However, manufacturers report anecdotal evidence that a portion of contractors and end-users do not read these instructions. The intent of requiring picture diagram-type installation instructions is to reach those contractors or end-users that ordinarily do not or cannot read text-only installation instructions.

4) Product Testing: Manufacturers are required to perform tests, according to the requirements included in this Version 2.0 specification, then submit qualifying model information to EPA for approval. The test results must be reported using the Residential Ventilating Fan Qualified Product Information (QPI) Form. Manufacturers are required to report fan performance information on the QPI Form using the following

units of measure:

- A. Airflow Rating (cfm): The airflow of a residential ventilating fan shall be measured in cubic feet per minute (cfm). The cfm values shall be measured by the method described in HVI Standard 916.
- B. Efficacy (cfm/W): The efficacy of the residential ventilating fan shall be expressed in cubic feet per minute per Watt (cfm/W). Manufacturers shall calculate efficacy by using the airflow and fan motor electrical power values determined by HVI Standard 916. Fan motor electrical usage will be the only energy consumption considered for the efficacy calculation. Energy used for other fan auxiliaries, such as lights, is not included in the determination of fan efficacy.
- C. Sound Rating (sone): The sound output of a residential ventilating fan is measured in sones. The sound ratings shall be measured by the method described in HVI Standard 915.
- D. Static Pressure Measurements: Ventilating fan performance characteristics such as motor wattage, cfm, and sones must be reported to EPA at specific static pressures. These measurements vary depending upon the fan type and follow HVI 920 rating points. Measurements shall be conducted in accordance with HVI 920 *Product Performance Certification Procedure Including Verification and Challenge*. The static pressure measurements are listed below.
 - 1. Ducted products (products with one duct such as bathroom fans, utility fans, and kitchen range hoods): 0.1 in. w.g. static pressure
 - a. Partner must also test and report products at 0.25 in. w.g. static pressure for airflow (cfm)
 - b. Partner is not required to test sound levels or wattage at 0.25 in. w.g. static pressure
 - 2. Direct discharge (non-ducted) products: 0.03 in. w.g. static pressure

Note: This new requirement of static pressure test conditions has been added to the specification to assure that all units being tested are done so using the same static pressure difference, since industry members are permitted to report rated airflows at different static pressures. The recommendation to include this came from both manufacturers and HVI. In addition, a 0.25 in. w.g. static pressure measurement requirement has been included for ducted products to reflect new performance requirements presented in Section 3.B.3. It is EPA's understanding that manufacturers currently perform tests at various static pressure levels and have this data in existing testing reports. Although HVI does not require manufacturers to report static pressure results outside of the required 0.1 in. w.g. static pressure; it is EPA's intention to require fan airflow measured at 0.25 in. w.g. in its Qualified Product Information (QPI) form for qualifying ventilating fan models. **Note: while the 0.25 in. w.g. airflow value will be required by the QPI form, this value will not be posted to the ENERGY STAR Web site; only the 0.1 in. w.g. airflow will be included in the qualifying product list.**

- 5) Effective Date: The date that manufacturers may begin to qualify products as ENERGY STAR under the Version 2.0 specification will be defined as the *effective date* of this agreement. The ENERGY STAR Residential Ventilating Fans (Version 2.0) specification shall go into effect on **TBD**. Any previously executed agreement on the subject of ENERGY STAR qualified residential ventilating fans shall be terminated effective **TBD**.

Note: EPA recognizes that manufacturers will need some lead time to: (1) identify the lamp/ballast combinations they are currently using and then select light sources that qualify; (2) make changes to existing units with night lights; and (3) produce new product literature, installation documents, and packaging. According to industry sources, ventilating fans typically remain on the retailer shelves for six to nine months and four to six months in the manufacturer's warehouse. Based on this preliminary information, it has been recommended to EPA that the effective date be at least six to nine months from the time the Version 2.0 specification is finalized to allow sufficient lead time to re-qualify existing products or qualify new products. **EPA is interested in discussing this effective date further; as such, manufacturers are encouraged to submit comments and/or suggestions on this issue.**

- A. Qualifying and Labeling Products under the Version 2.0 Specification: All products, including models originally qualified under Version 1.0 with a **date of manufacture** after **TBD**, must meet Version 2.0 requirements in order to use the ENERGY STAR on the product or in product literature. The date of manufacture is specific to each unit, and is the date on which a unit is considered to be completely assembled.
- B. Elimination of Automatic Grandfathering: Under Version 2.0, ENERGY STAR has made significant changes with regard to product qualification and labeling during specification transitions. **ENERGY STAR qualification under Version 2.0 is not automatically granted for the life of the product model.** To be qualified as ENERGY STAR, a product model must meet the ENERGY STAR specification in effect on the date of manufacture.

Note: ENERGY STAR has made this important programmatic change for two reasons:

- 1. To deliver on expectations about ENERGY STAR by ensuring that the products perform at levels promised by the program.
- 2. To ensure that ENERGY STAR's ability to differentiate more efficient products is not undermined by high percentages of labeled products qualifying at less stringent performance levels.

- 6) Future Specification Revisions: ENERGY STAR reserves the right to revise the specification should technological and/or market changes affect its usefulness to consumers, industry, or the environment. In keeping with current policy, revisions to the specification are arrived at through discussions with industry.